

What is claimed is:

1 1. An information processing apparatus including a  
2 processor that has at least one register and performs  
3 processing according to a machine language program, the  
4 register retaining data used in computation, the information  
5 processing apparatus comprising:

6 a compression judgment unit operable to judge whether  
7 the machine language program has information indicating that  
8 the data retained in the register should be compressed and  
9 then saved to a stack memory in response to call of a  
10 predetermined function; and

11 a save unit operable to, when the judgment by the  
12 compression judgment unit is affirmative, compress and then  
13 save the data retained in the register to the stack memory  
14 in response to call of the predetermined function.

1 2. The information processing apparatus of Claim 1, further  
2 comprising:

3 a decompression judgment unit operable to judge whether  
4 or not there is decompression information indicating that  
5 the data saved in the stack memory should be decompressed  
6 and then restored to the register in response to termination  
7 of the call of the predetermined function; and

8 a restore unit operable to, when the judgment by the  
9 decompression judgment unit is affirmative, decompress and

10 then restore to the register the data saved in the stack memory  
11 in response to termination of the call of the predetermined  
12 function.

1 3. The information processing apparatus of Claim 2,  
2 wherein the decompression judgment unit judges whether  
3 the machine language program has the decompression  
4 information.

1 4. The information processing apparatus of Claim 3,  
2 wherein, when the judgment by the compression judgment  
3 unit is affirmative, the save unit compresses and then saves  
4 the data retained in the register to the stack memory when  
5 execution of a call instruction for calling the predetermined  
6 function,

7 and when the judgment by the decompression judgment unit  
8 is affirmative, the restore unit decompresses and then  
9 restores to the register the data saved in the stack memory  
10 when execution of a return instruction for terminating the  
11 call of the predetermined function.

1 5. The information processing apparatus of Claim 3,  
2 wherein, when the judgment by the compression judgment  
3 unit is affirmative, the save unit compresses and then saves  
4 the data retained in the register to the stack memory when

5 a process for the predetermined function starts,  
6 and when the judgment by the decompression judgment unit  
7 is affirmative, the restore unit decompresses and then  
8 restores to the register the data saved in the stack memory  
9 when the process for the predetermined function finishes.

1 6. The information processing apparatus of Claim 2,  
2 wherein the save unit, when compressing and saving the  
3 data retained in the register to the stack memory, associates  
4 the decompression information with compressed data resulting  
5 from compressing the data retained in the register, and saves  
6 the decompression information and the compressed data in  
7 association to the stack memory,  
8 the decompression judgment unit judges whether the stack  
9 memory has decompression information that is associated with  
10 data saved in the stack memory, and  
11 the restore unit, when the judgment by the decompression  
12 judgment unit is affirmative, decompresses and then restores  
13 to the register the data associated with the decompression  
14 information in response to termination of the call of the  
15 predetermined function.

1 7. The information processing apparatus of Claim 6,  
2 wherein the save unit comprises:  
3 a data conversion subunit operable to convert first data

4 retained in the register into second data according to a  
5 predetermined algorithm;

6 a comparison subunit operable to compare the data size  
7 of the second data with a threshold value that shows compression  
8 efficiency; and

9 a selective save subunit operable to, when the data size  
10 of the second data is smaller than the threshold value, save  
11 the second data to the stack memory, and when the data size  
12 of the second data is greater than the threshold value, save  
13 the first data to the stack memory.

1 8. The information processing apparatus of Claim 6,  
2 wherein, when the judgment by the compression judgment  
3 unit is affirmative, the save unit compresses and then saves  
4 the data retained in the register to the stack memory when  
5 execution of a call instruction for calling the predetermined  
6 function,

7 and when the judgment by the decompression judgment unit  
8 is affirmative, the restore unit decompresses and then  
9 restores to the register the data saved in the stack memory  
10 when execution of a return instruction for terminating the  
11 call of the predetermined function.

1 9. The information processing apparatus of Claim 6,  
2 wherein, when the judgment by the compression judgment

3 unit is affirmative, the save unit compresses and then saves  
4 the data retained in the register to the stack memory when  
5 a process for the predetermined function starts,  
6 and when the judgment by the decompression judgment unit is  
7 affirmative, the restore unit decompresses and then restores  
8 to the register the data saved in the stack memory when the  
9 process for the predetermined function finishes.

1 10. An information processing method used with an  
2 information processing apparatus including a processor that  
3 has at least one register and performs processing according  
4 to a machine language program, the register retaining data  
5 used in computation, the information processing method  
6 comprising:

7 a compression judgment step of judging whether the  
8 machine language program has information indicating that the  
9 data retained in the register should be compressed and then  
10 saved to a stack memory in response to call of a predetermined  
11 function; and

12 a save step of, when the judgment at the compression  
13 judgment step is affirmative, compressing and then saving  
14 the data retained in the register to the stack memory in response  
15 to call of the predetermined function.

1 11. A program conversion apparatus comprising:

2        an acquisition unit operable to acquire an input program  
3        that includes one or more functions;  
4        a judgment unit operable to judge, from the input program,  
5        whether, in response to call of a predetermined function,  
6        data retained in at least one register of a processor should  
7        be compressed and then saved to a stack memory, or should  
8        be saved to the stack memory without being compressed; and  
9        a conversion unit operable to, when the judgment unit  
10       has judged that the data should be compressed and then saved,  
11       convert the input program into an output program that includes  
12       indication information, the indication information  
13       indicating, to the processor, that the data retained in the  
14       register should be compressed and then saved to the stack  
15       memory.

1    12.    The program conversion apparatus of Claim 11,  
2        wherein the judgment unit includes:  
3        a detection subunit operable to detect a stack access  
4        function in the input program, the stack access function  
5        referring to the stack memory in which the data in the register  
6        have been saved,  
7        and the judgment unit judges that the data retained in  
8        the register should be saved to the stack memory without being  
9        compressed in response to call of any of the stack access  
10       function and functions that position higher order than the

11 stack access function in a hierarchical structure of functions  
12 included in the input program.

1 13. The program conversion apparatus of Claim 11,  
2 wherein the judgment unit includes:  
3 a pre-specification detection subunit operable to  
4 detect a pre-specified function in the input program, the  
5 pre-specified function being a function to which information  
6 indicating that the data retained in the register should be  
7 compressed and then saved to the stack memory has been added  
8 in advance,  
9 and the judgment unit judges that the data retained in  
10 the register should be compressed and then saved to the stack  
11 memory in response to call of the pre-specified function.

1 14. The program conversion apparatus of Claim 11,  
2 wherein the judgment unit includes:  
3 a nest information creation subunit operable to create  
4 nest information that shows a hierarchical structure of  
5 functions included in the input program,  
6 and when the predetermined function includes therein  
7 a subroutine, the judgment unit judges whether, in response  
8 to call of the predetermined function, the data retained in  
9 the register should be compressed and then saved to the stack  
10 memory, or should be saved to the stack memory without being

11 compressed, based on the nest information.

1 15. The program conversion apparatus of Claim 11,

2 wherein the conversion unit includes:

3 a compression information addition subunit operable to  
4 add, to a call instruction for calling the predetermined  
5 function, information indicating to the processor that the  
6 data retained in the register should be compressed and then  
7 saved to the stack memory when the predetermined function  
8 is called; and

9 a decompression information addition subunit operable  
10 to add, to a return instruction for terminating the call of  
11 the predetermined function, information indicating to the  
12 processor that the data saved in the stack memory should be  
13 decompressed and then restored to the register when the call  
14 of the predetermined function is terminated.

1 16. The program conversion apparatus of Claim 11,

2 wherein the conversion unit includes:

3 a compression information addition subunit operable to  
4 add, to the predetermined function, information indicating  
5 to the processor that the data retained in the register should  
6 be compressed and then saved to the stack memory when a process  
7 for the predetermined function starts; and

8 a decompression information addition subunit operable



9 to add, to the predetermined function, information indicating  
10 to the processor that the data saved in the stack memory should  
11 be decompressed and then restored to the register when the  
12 process for the predetermined function finishes.